



# MALIGNANCY OF THE HYPOPHARYNX

Donald C. Stahl



Gift of

Dr. Donald P. Shedd







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A REVIEW OF THE LITERATURE AND ANALYSIS OF 59 CASES FROM THE G-NHCH RECORDS

Donald C. Stahl

B.A. Princeton University 1953

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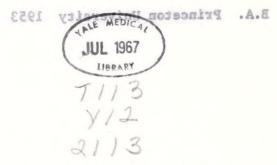
A thesis presented to the faculty of Yale University School of Medicine in partial fulfillment of the requirements for the degree, Doctor of Medicine.

Department of Surgery

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# TABLE OF CONTENTS

Introdu	ction	1
Anatomy	and Classification	4
Inciden	ce	6
Etiolog	ic Consideration	8
Clinica	l Picture	9
Diagnos	is	13
Prognos	Site Histology Stage Size	15
History	7	21
Treatme	ent Radiology Surgery	. 27
Conclus	sions	36
Summary	7	38
Bibliog	graphy	39

# TABLE OF CONTENTS

Introducti			1
Anatemy as	nd Classificati	no	43
Incidence			9
Etiologic	Consideration		8
Clinical F	Picture		6
Diagnosis			13
Prognostic	c Criteria Site Histology Stage Size	A.E.	15
History			21
Treatment	Radiology		27
Conclusion	lo loomba		
Summary			38
Bibliograp	bhy		39

#### INTRODUCTION

The study of malignancy of the hypopharynx is both an intriguing and a discouraging one. Some of the more difficult problems of diagnosis and treatment of cancer are encountered. Malignant disease in the laryngeal portion of the pharynx is not a particularly rare condition; these lesions are often the cause of appalling distress and only infrequently do they yield to treatment. Contributing to this discouraging fact is the degree of advancement which is usually present at the time of diagnosis. This delay in detection is rarely due to the lack of diagnostic procedures, for physical and radiological examinations of the area are easily available today. Tumors in this site unfortunately do not produce sufficient symptoms for the patient to seek early medical advice.

When extension of the tumor is of sufficient degree to produce symptoms, there rapidly progresses involvement of many of the numerous functions which are concentrated in the laryngopharyngeal region. Deglutition usually is first involved due to pharyngeal obstruction and ulceration; speech is frequently affected either by involvement of the adjacent recurrent laryngeal nerves or by direct extension to the cords. Then respiration may be affected due to obstruction of the larynx or 43,46 of the lumen of the trachea. As Orton states, cancer in this area does not grow particularly rapidly, however, early metastases are the rule rather than the exception. Local cervical masses are frequently the initial symptom.

Despite (or perhaps because of) a respectable amount of literature which has been written on the subject many areas of confusion and controversy exist, the most basic being a general disagreement as to just what composes the hypopharynx. Various anatomical descriptions differ over inclusion of the vallecula and epiglottis at the superior pole, the laryngeal orifice in the midregion and the cervical esophagus at the inferior border. Although such anatomical discrepencies may on the surface seem minor, it must be realized that in the general area of the laryngopharynx very

The study of malignarmy of the bypopmaryons is both an intriguing and ediacouraging one. Some of the oure difficult proview, of diagnosis and creations of assess are encountered. Malignant disease in the large all portion of the pharyon is not a particularly rate continuing these lettons are often no ones of appailing distress and only infraquently do they yield as resument. Contribution to this distress and only infraquently do they yield as resument. Contribution at the the star of diagnosis. This delete of advance and which the unually present at the time of diagnosis. This delete of advance is ratedly due to the lack of diagnosise for physical and radical against enterior of the area are easily available today. Throws in this size unfortunately to are produce safficient approach for the patient to much easily advice.

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 slight differences in location of a tumor may quite definitely change the whole concept of prognosis and treatment. It will readily be seen that some sort of anatomical standardization must be established as well as a standard for classification of the tumors included in these confines so that the criteria of therapy and the results of this therapy in different surveys may be intelligently compared.

The treatment of carcinoma of the hypopharynx has been developed over the past half century and has followed two very divergent courses.

The early treatment of malignancy in this region was surgical excision which followed closely the early attempts at extirpation of carcinoma of the cervical esophagus in the last 2 decades of the 19th century. It remained for Wilfred 58

Trotter, an English Surgeon, to define the difficulties and describe a method of lateral pharyngotomy in 1913 which is basic even today. The proponents of surgical treatment were few (Trotter and A. Logan Turner in England and Henry B. Orton in this country were notable) as was the number of cases treated; moreover, the results were discouraging, with high operative mortality and the inevitable results of surgery of this region: Mutilation with loss of function. Far from discouraged, Trotter stated \*No matter what may be our hopes about the discovery in the treatment of malignant disease of methods more specific and less harsh, surgical operation must be admitted to be the most useful and trustworthy means we now possess."

Meanwhile irradiation had made some progress in this field - developed mainly by the French: Coutard who developed the method of fractional treatment and 1,2,25

Baclesse in Paris and Several Workers at the Radiumhemmet in Stockholm.

But the cure rate for irradiation of cancer of the hypopharynx was quite disappointing when compared to the expanding and successful field of irradiation of cancer of the larynx proper, 5 year cure - rates were consistently in the 3-8% range.

Since World War II, renewed interest has developed in radical surgical methods.

Where Trotter avoided the "mutilating" effect of laryngectomy this is now thought

slight differences in location of a temps as present charge the shold concept of pregnosis and ireatence. It this results he see charge the sees of santomical standard cattom on the sees of the remote included in these confines on the tribute of the fire of the fire of the fee the results of this characters in the surveys cary so inculty cooperad.

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to be the only chance for survival in many patients. Harold Wookey of Toronto described a combined pharyngolaryngectomy with skin flap reconstruction of the pharynx which has become the standard of surgical treatment of certain of these malignancies. Preliminary reports of the results of present methods of radical surgery are promising. In addition to modified approaches to this relatively inaccesable area surgery has been aided by advances in anaesthesiology and in antibiotic control of concomitant infection.

It is the purpose in the following pages to present in brief form some of the material which has accumulated over the last half century in regard to the natural history of carcinoma of the hypopharynx, its incidence, classification and the clinical picture that the condition presents. In regard to the choice of therapy I will trace some of the developments up to the present day and the therapeutic aims and results.

It is of interest that the few papers that have appeared citing any appreciable number of therapeutic results have emanated from the larger centers of radiation therapy or from the few men who are actively engaged in surgical treatment. On the other hand, I should like to present the statistical results of therapy of hypopharyngeal malignancy from the records of a general hospital where there is no large referral of patients either for surgical or radiological treatment of this condition. It is felt that the records of Grace-New Haven Community Hospital reflect a fair cross-section of cases of carcinoma of the hypopharynx as might be seen at any similar general hospital.

to be the self chance for strateal in any malence. Hazeld nowed of Terrane described a combined pheryphylogy to the sign the remonstruction of the phates become the backer of anythel third the remonstruction of the self-phanetes. Preliminary to the the results of product between a subject and respectively are producted as surgery has been sides by thence in anyther results are surgery has been sides by thence in anyther results of concombinations.

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#### ANATOMY AND CLASSIFICATION

The hypopharynx as an anatomic entity is shrouded by much confusion in regard to its actual limits on the one hand and to the various anatomical sub-divisions within, on the other.

The hypopharynx is concerned with the passage of both air and food. It is the lowest of the three portions of the pharynx, namely the nasopharynx, the oropharynx and the hypopharynx (or laryngopharynx). At this point I would like to emphasize that the terms hypopharynx and laryngopharynx are synonymous and are 33 used interchangeably. Lederinan states that the two may be synonymous in an anatomic sense but in terms of tumor study are not only not synonymous but not even definite anatomic regions. I feel that strict anatomic definition must be maintained even in tumor study in order intelligently to assay prognostic and therapeutic considerations.

The hypopharynx is that portion of the pharynx which lies posterior to the larynx. Variations exist as to the definition of its actual limits. The superior limit has been placed as far anterosuperiorly as the base of the tongue. The 5 pharyngoepiglottic fold has been suggested as well as the vellecula (the sinus between the base of the tongue and the anterior surface of the epiglottis). The epiglottis is used as the upper border in this study. The lower limit is more easily determined; it is at the esophageal ostium at the level of the sixth cervical vertebra. The line of demarcation between larynx and hypopharynx is taken as the outermost margin of the laryngal inlet including the edge of the epiglottis, the 27 aryepiglottic folds and the arytenoids .

In reviewing the literature on this subject it would appear that each investigator has his own method of classification of tumors of the hypopharynx.

Few are widely used and none is generally accepted.

58,60,64

The earliest classification was that of Trotter who differentiated three groups of tumors of the lower pharynx: 1) epilaryngcal (those adjacent to the laryngcal orifice, 2) pyriform sinus, and 3) hypopharynx. Trotter thus

## ANATOMY AND CLASSIFICATION

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POSTERIOR VIEW OF HYPOPHARYNX

	ADDITION OF THE PARTY OF THE PA
Uvula Palatine tonsil Tongue Palatopharyngeal Arch Epiglottis Aryepiglottoc Fold Pyriform sinus Thyroid Cartilage Post Arytenoid area Lateral Pharyngeal Wall Post-Cricoid area	
Palatine tonsil  Epiglottis Vallecula	
Hypopharynx	
Thyroid Cartilage Ventricular fold Cricoid Cartilage	
Cervical Esophagus	

LATERAL VIEW OF HYPOPHARMNX



differed from current views in that he defined the hypopharynx as merely one subdivision of what we know as the laryngopharynx or hypopharynx.

In some series the epilaryngeal group as well as the pyriform sinus group has been included in the studies of the larynx proper however the differences of the nature of these tumors, their therapy and prognosis are quite exclusive.

Numerous classifications have been formulated resulting in confusion when 27 comparing results of therapy. The Swedish writers, Jacobsson in particular, 56 differentials only two main groups; mainly because in Scandinavian surveys there has been quite obvious demarcation of tumors of the upper (epilaryngeal and pyriform sinus) tumors and lower (posterior cricoid and pharyngeal wall) tumors. "The reason for this division are differences in prognosis, sex distribution 27 and predisposing factors".

Since there is relatively greater reliance on surgical treatment in other countries, however, some more definitive classification is desirable such as that 32,33,34 3 proposed by Lederman and Cade and Allchus. This appears to be a simple and workable classification:

- 1. Epilaryngeal (epiglottis, aryepiglottic folds and arytenoid region)
- 2. Pyriform sinus
- 3. Epiesophageal (Post cricoid and cervical esophagus)
- 4. Posterior and lateral walls.

It can be seen that 1 and 2 comprise the "upper" group and 3 and 4 comprise the "lower" group. Occasionally all tumors in the lower group are referred to as Post Cricoid. It must be remembered that many tumors will be of such extent that designation of primary site will be impossible.

distance From current views in that he called the hypopharyon as easily manufativision of that we have as the introduction in hypopharyon.

In action of these country, they are the property of the profit that the profit of the series and the profit of the series of these country, and the series of these country.

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- 1. Eptharyngesi (cyigloctis, armpigioteic folls and acyteral's regimes
  - 2. Pyriform sinus
  - 3. Egianophagaal (Your cricold and pervious exceptagas)
    - 4. Posterior and lateral walls.

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## INC IDENCE

There are no accepted estimates of the incidence of tumors of the hypopharynx . 37

Martin states that carcinoma of the hypopharyngeal walls alone account for 0.5% of all malignancies. This is probably too high, the incidence of carcinoma of the entire hypopharynx being probably below this figure. Malignancy in the mouth and oral pharynx accounts for about 4% and in the intrinsic larynx 2% of all cancer. The incidence of hypopharyngeal malignancy in Scandinavian countries is considerably higher.

The age incidence is the usual cancer range. Some earlier reports claimed a 58 younger age incidence. Trotter states that the age range of males was 40-60 and females, 30-50. Graham gives average ages of 45 for females and 57 for males. 13 Dunlop's overall average of 62 is probably more correct. In the present series the overall mean is 61.2 years, females having a slightly younger range and mean: males 61.9, females 58.6 years.

There is also a characteristic sex distribution of these lesions. In Sweden 1,27,56

females compose the majority of patients (53-60%). In English, French, 37,45,72

and American studies the range varies from 5% to 30% females. In the present series of 59 patients there are 11 or 19% females reflecting the dominance.

Table #1

Age and Sex distribution - all cases

Age	Women	Men	Total	
-40 years	-	1	1	
41-50 years	3	2	5	
51-60 years	2	16	18	
61-70 years	5	22	27	
71-80 years	1	6	7	
81-	-	1	1	
	11	48	59	

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Sheef is also a characterially sex distribution in these Laglons. In Tring, 1, 1/3,50

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Age and Sex distribution - all cases

Table #1

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1	Į.		-40 years
	I.		41-20 years
		*,	5 1 - FD 3000 C
27	22	5	61-70 years
F	ò	1	71-80 years
I	1		-18
59	48	12	

patients is a similar distribution of tumors of the upper and lower portions of the hypopharynx. The Scandinanvians report incidences of lower (post cricoid etc) lesions in 40-75% of cases. In France, England and the United States incidences of 15-25% are usual. In the present study there were 10 or 18% in the lower group, 63% in the upper group and 19% of undetermined or extensive origin.

Of interest is the high incidence of post cricoid carcinoma in Scandinavian females which has been explained by the much higher incidence of the Plummer-Vinson syndrome in these countries and also the rarity of lower lesions in France and the almost complete absence of females in one series from France.

Paralleling this characteristic varieties to the Comic proportion of patients is a similar distribution of comors of the Opper and lower particular of the Cympres, and Lower particular of the Cympres, and Cympres of the Cympres, and Cympres of the Cympres of th

Of interest is the high incidence of post oxicols surctions in itsnoities.

Emmiles enten has been explained by the much higher incidence of the Pipezer-Vincon syntroms in these countries and also the rayity of lover lesions in France and the desire of femiles in one series for the Prence.

#### ETIOLOGIC CONSIDERATIONS

A wide variety of hereditary, hygeinic, and environmental factors have beem implicated by suggestion as possible etiologic factors in carcinoma of the hypopharynx.

Race, religion, and nationality are three factors that are frequently mentioned.

Of the present 59 cases only 1 occurred in a negro. Religion was determined in

55 - Protestant - 29, Catholic - 25, Jewish - 1. Nationality was determined in 53

cases. In most, foreign nationality was assigned only when the patient was born

in another country or when both parents were born in another country. The only

large groups were Irish - 7, Italian - 6, German - 4, 21 were classed as American.

The above figures and the resultant percentages do not differ significantly from
the general population of this area.

A familial history of carcinoma has also been proposed as a possible contributing etiologic factor. Family history was obtainable in 40 cases; of these 11 presented a history of carcinoma in one or more members of the immediate family.

Oral hygiene has been implicated in many of the more common malignancies of the month and oral pharynx. In this survey the state of oral hygiene was determined in 45. The results are:

Good	4
Fair	4
Poor	22
Edentulous	15

Perhaps two of the most commonly investigated factors in regard to their 1,27 predisposing properties are excessive use of alcohol and tobacco. Almost

half of the case records lack such information. These findings are summarized:

	Alcohol	Tobacco
Heavy use	14	17
Moderate	11	12
ō - minimal	7	3
No information	25	25

Attempts to demonstrate industrial predisposition were indeterminate.

Occupation was recorded in 50 cases, and a widespread cross-section of all general groups was obtained.

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A firstical history of certabona has also been proposed in a pointiff contribe contribe vetty; citologic factor. Yearly history was obtainable in Quasiant of this in presented a history of eacting in one or once nothers of the immediate form, y.

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22	Poor
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half of the case records lacs, such wish wish without the country of

nasadaT	Alcohol	
1.7	14	Heavy use
12	11	Moderate
E	7	o - wintmal
25	25	No information

Accompts to demonstrate fulcation processors and administration

Occupation was recorded in 10 caper, and a widespasse ergode. Thus at all gameral groups was obtained.

Six of the 59 patients had other malignancies diagnosed either before or at the time of diagnosis of carcinoma of the hypopharynx.

One female in the group presented a well documented 10 year history of Plummer-Vinson Syndrome. In Scandinavia this syndrome of hypochronic microcytic iron-deficiency anemia, dysphagia and glossitis is more common than elsewhere. It 43 occurs in females and has been reported in males following gastrectomy. Question of the precancerous properties are raised by Rennaes because of a 10% incidence of Plummer-Vinson Syndrome in all patients who develop hypopharyngeal cancer 56 and a 30% incidence in females who later develop post cricoid carcinoma. Incidence of pre-existing Plummer-Vinson Syndrome in this country is much lower.

#### SYMPTOMATOLOGY

Unlike the more frequent tumors of the lip, tongue, mouth, and oropharynx.

malignancy in the laryngeal portion of the pharynx is a relatively silent lesion.

The former tumors may be characterized by a very obvious ulceration or growth while the latter only very infrequently give rise to early vague symptoms.

Exclusing the cases with pre-existing Plummer-Vinson Syndrome which is very rare in this country, early symptoms may include a mild pharyngitis and abnormal 2,29 sensation of foreign body on deglutition. This irritation has been variously described as a tickling or prickling sensation in the lower pharynx. This rather mild symptom is quite common and is probably overlooked or forgotten in many more 48,49 cases.

Dysphagia is of course the most characteristic and most common symptom in this condition. The dysphagia may be long-standing, minimal and slowly progressive; it is the initial symptom in many cases, and is a presenting complaint in most. In the present review of cases 40% showed dysphagia as a primary symptom and 80% presented with some degree of dysphagia. As in carcinoma of the esophagus, dysphagia is not a particularly reliable symptoms, since it may have been present for many years (Plummer-Vinson) or, on the other hand, it 74 may be absent in terminal cases.

Six of the 59 perients rad other malignamies diagnossi at the time of diagnosts of carcinous of the hypophasy w.

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### STREWGIOLOGY

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sensation of foreign body on degimetrion. This irritation has one without described as a finising or priciple snassion in the lower one or make the mine alld species is suite common and is probably oregional or formula in many and degice.

Bysyling is of course the same characteristic and now common symical in this condition. The dysplagia and is long-strading, minimal and about progressive; it is the initial sympton in many cases, and it is presenting completed in nout. In the present region of cases 60% showed dysplaying to private the presenced with some dense of dysplaying the careful of the caseshages, dysplaying at most a particularly reliable as proma, which is may have seen orasent for owny course ("The service is, on the other hard, it may be absent in terminal cases."

Sore throat without dysphagia occurs initially in about 15%, about the same percentage for hoarseness. Hoarseness, it must be remembered, may reflect either involvement of the cords by direct extension into the larynx or involvement of the recurrent laryngeal nerves by local extension.

As evidence of the advanced stage of tumor that is present in many patients, 12 cervical nodes may be palpable in 30% of cases on initial exam. Extension 43 to local cervical nodes is an early and common feature of this tumor. This "late" symptom of hypopharyngeal cancer, was present in 45% of the cases reviewed here. Weight loss was an initial symptom in only 1 case but was present in over 1/3 of the cases on first visit.

Other less frequent presenting symptoms include pain on swallowing which may radiate to the ear, cough with or without hemoptesis, excess salivation and dyspnea.

Table # 2
Initial symptom (s) - all cases

Symptom	No. of cases
Dysphagia	22
Cervical mass	13
Sore throat	10
Hoarseness	9
Pain	8
"Abnormal sensation"	5
Cough	3
Weight loss	1
Dyspnea	1

Sore throat without dyamagus status and thour tot, about the asme percentage for boarstasson. Yourseness, it must be required, way taking either involvement of the cours by direct artenains with the large as the course of the recurrent large as the sympth of the recurrent large as the course of t

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Table \$ 2 Initial symptom (a) - all cases

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No. of eases	Symp com
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22	Dysphagia
C)	C. FYLCEL TORSE
10	Sore throat
E	Hoarseness
\$	Pain
	h in line line la monda
€.	Cough
1	Weight loss
See .	Dyspaea

Table # 3

Symptoms on Admission - All Cases

Symptoms	No. of cases
Dysphagia	44
Mass	26
Hoarseness	23
Wt. loss	21
Pain	14
Sore throat	11
Hemoptysis	10
Dyspnea	6
Excess saliva	6
Abnormal sensation	6
Fatigue	2

Because malignancy of the hypopharynx is quite often divided into two major subdivisions - upper and lower, several writers have sought to differentiate 8,21,50 between the clinical picture in the two groups. In the epilaryngeal group hoarseness is a more frequent finding as is dyspnea; pain and dysphagia may be only late symptoms. When the pyriform sinus is the initial site hoarseness may occur later. When the lateral and posterior walls or the post-cricoid region are involved. Moarseness may occur infrequently with dysphagia and cervical metastases developing first.

Orton states that the generally poor prognosis depends on the very late diagnosis which is made in most cases. This is undoubtedly true, however, there is little evidence in the literature to substantiate his statement that: "Usually one year has elapsed from the time the patient realizes that something is not 43 16 altogether right in his throat before ....advice is sought". Graham makes an estimate of 4½ months duration until medical advise is sought which seems to be closer to the actual figure. In the present series an average duration of 5.6 months from the onset of the initial symptoms until the first visit at the New Haven Hospital is noted. One patient not included in this figure exhibited Plummer-Vinson Syndrome for 10 years.

Symptoms on Admission - All Cases

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Pain	
Sore throat.	a transfer of the second
Dyspnes	ortwo tombour
Abnormal sensation Fatigue	ters of the section of
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Table # 4
Duration from Onset of Symptoms to Admission

Months	No. cases	Months	No. cases
less than 1	5	6	11
1	8	8	4
2	4	12	5
3	8	18	2
4	6	24	1
5	3	more than 24	2
			59

Average duration 5.6 months.

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	14	8)	€.
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5	mark then 24	5	8
V12		.orimar o.c	Average oura. ton

#### DIAGNOSIS

"When a patient of 40 or over complains of pain in the retrohyoid region, with huskiness of voice, pain and difficulty in deglutition, and swelling in the median or lateral portion of the neck along the border of the sternomastoid a malignant 42 condition must be thought of and a very careful examination should be made."

Various procedures helpful in this examination are direct inspection of oropharynx, indirect mirror examination of hypopharynx and larynx, direct laryngoscopy, x-ray with Barium Swallow and esophagoscopy if necessary. Biopsy is performed at time 75 of endoscopy. Ackerman and Regato claim that "repeated examinations through the mirror will contribute more information than will be obtained by direct pharyngoscopy".

In both mirror exams and direct pharyngoscopy there are four important findings
42,50
which may indicate malignancy.

- 1. Altered movements of arytenoids on phonation and/or inspiration.
- 2. Edema of the arytenoid region.
- 3. Puddling of secretions in one or both pyriform sinuses
- 4. Ulceration or tumor.

In addition there may be edema of the vocal cords or even extension of the tumors to the endolarynx. (There may be some degree of forward displacement of the larynx.) As mentioned, biopsy of the ulcerated area is performed at laryngoscopy.

No pharyngeal workup is complete without x-ray examination. In the upper group it may supplement laryngoscopic examination but in the lower group of postcricoid and pharyngeal wall tumors, radiology "takes first place over endoscopy 69 and becomes the paramount diagnostic method".

Solve Welin from Stockholm describes the abnormalities that are noted on plain films and barium swallow spot films to illustrate the mucosal relief patterns. In addition he presents a schematic picture of the hypopharynm as seen radiologically so that the normal structures may be recognized. By this, even quite small mucosal alterations may be traced in other films by comparing precise locations. Enlargement

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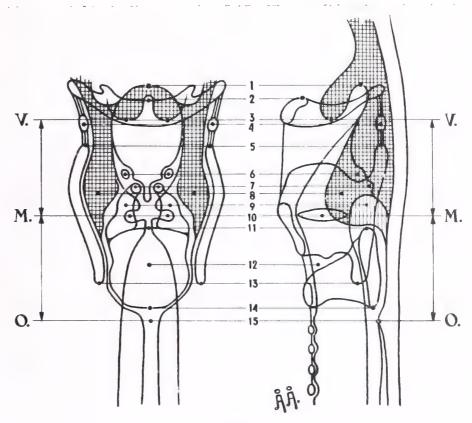


Fig. 1.

Fig. 1. Drawings Showing the Roentgenologic Appearance of the Larynx and the Pharynx and the Planes of Orientation.

- V Vallecula-plane, M Morgagni-plane, O Esophageal Opening-plane.
  - 1 = Superior border of the epiglottis.
  - 2 = Superior border of the hyoid bone.
  - 3 = Bottom of the valleculae ej iglotticae.
  - 1 =: Triticeous cartilage.
  - 5 = Apex of the cornu superior of the thyroid cartilage.
  - 6 = Cunciform tubercle (Wrisbergii).
  - 7 Corniculate tubercle (Santorini).
  - 8 = Recessus pyriformis.
  - 9 = Region of the arytenoid cartilage.
  - 10 = Ventriculus laryngis Morgagni.
  - H = Superior border of the signet-plate of the cricoid cartilage.
  - 12 Subglottic laryngeal cavity.
  - 13 Apex of the cornu inferior of the thyroid cartilage.
  - II Inferior border of the signet-plane of the cricoid cartilage.
  - 15 Esophageal Opening (Killian's "mouth of the esophagus").

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		,

in the arytenoid region, broadening of the aryepiglottic fold, absence of barium and distortion of either pyriform sinus, pathological relief pattern in the post-cricoid region and increase in the pre-vertebral mass may be noted on the PA and lateral films. Information as to the exact site, the size, and extent of local invasion may be available to the clinician.

The differential diagnosis of other conditions which may produce dysphagia and pain in the pharyngeal region may be possible by radiologic examination.

Characteristic x-ray finding occur in Plummer-Vinson Syndrome; these are constricting webs usually present in the cervical esophagus. Retropharyngeal abscess, paralysis of the pharyngeal muscles and Zenker's pulsion diverticulum have characteristic x-ray appearances.

There is a typical atrophy of the mucous membrane after x-ray therapy and a late reaction which may be mistaken for local recurrence, on x-ray examination; there is increase of prevertebral soft tissue and a ragged appearance of mucosa.

The changes regress with further radiation.

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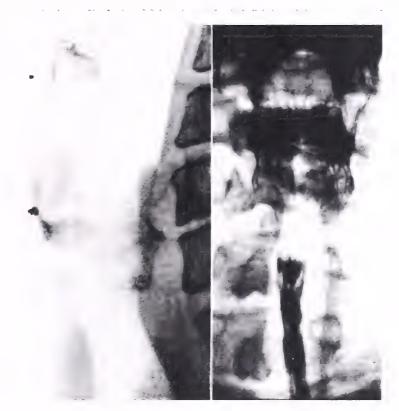


Fig. 2 a.

Fig. .2 b.

i. 2 a. Lateral view of a normal case, Partial calcification of the laryngeal cartilage. No calcification of the lower parts of the cricoid cartilage.

t. 2 b. Postero-anterior view with normal mucosal folds.

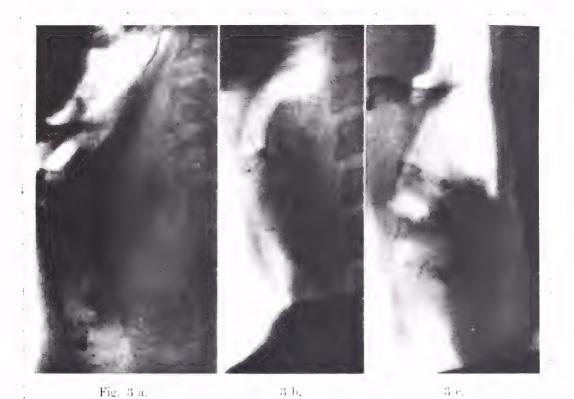


Fig. 3. Various types of prevertebral tumor shadows.
a. Case 26. Longish, spool-shaped soft-tissue shadow and dislocation of the larynx and the trachea in forward direction and a tumorous bulge of the posterior tracheal wall.
b. Case 27. Plateau-shaped soft-tissue shadow and destruction of the thyroid cartilage.
c. Case 17. Round distal soft-tissue shadow causing the cricoid cartilage to be placed at an angle to the thyroid cartilage.





Fig. 4. Case 23. Pathologic post-cricoid mucosal pattern of neoplastic origin (a, b) no more visualized after irradiation treatment (c). Prevertebral soft-tissue shadow somewhat

thickened.



Fig. 7 a.

Fig. 7. Case 26. Longish, circular tumor defect presenting frayed contours and bulging into the lumen, especially from the left.

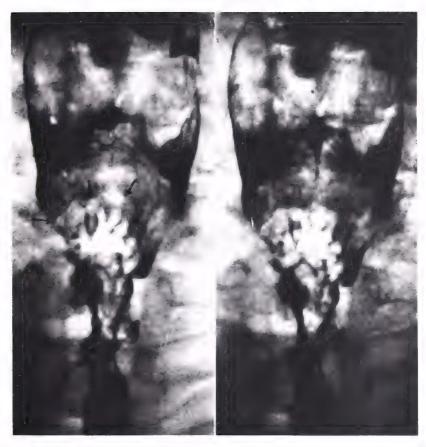


Fig. 8 a. 8 b.

Fig. 8. Circular tumor presenting on its upper limits toward the right pyriform sinus a plug-shaped defect, constantly appearing in several serial roentgenograms (see arrows).

#### PROGNOSTIC CRITERIA

## 1. SITE:

In discussing the classification of hypopharyngeal tumors the basic division into upper and lower groups was mentioned. It will be remembered that the former group, composed mainly of males was more prominent in English, French, and American reviews whereas the lower group was more frequent (40-75%) in Scandinavian studies. Further subdivision in classifying these tumors was suggested, one of the more workable classifications being:

- 1. Epilaryngeal ("extrinsic larynx")
- 2. Pyriform sinus
- 3. Epiesphageal or Post Cricoid (and Cervical esophagus)
- 4. Posterior and Lateral Walls.

Accurate determination of primary site is necessary for comparative studies, for proper assessment of prognosis and to provide a basis for selecting 33 different methods and techniques of treatment. However, in many cases either sufficient diagnostic evidence of primary site is absent or the tumor may be 30 extensive that determination of primary site may be impossible. This was the case in almost 20% of the present cases. In very few of the reviews of hyoppharyngeal malignancy which are available, is there definite classification of the primary sites; and of these only three or four writers list the number of cases according to primary site with percentage of total. Those so listed are compiled in table form below. The rather substantial difference in primary site incidence are probably due in part to discrepencies of criteria of anatomic classification.

Table # 5

Primary lesions by Anatomic Classification - 3 authors

			16		33		45		
		Gra	ham	Lede	rman	Orto	n	Total	
	site	No.	7.	No.	%	No.	7.	No.	%
1.	Epilaryngeal	39	30	88	21	58	41	185	27
2.	Pyriform sinus	22	17	163	39	45	32	230	34
3.	Post cricoid	46	36	144	34	24	17	214	31
4.	Post & Lat. Wall	21	17	22	6	13	10	56	8
		128		417		140		685	

### t. GIII:

In discussing the discaldisection of hypophasytycal toward the basic divingon into upper and lover groups was sentioned. It will be removed that the take some the former group, composed makely of select was note prominent in fuglish, Franch, and American reviews whereas the lover group was much frequent (40-151) in Scandinavian studies. Further subdistance in class fying these tenore was

suggested, one of the more workable classifications lefar:

- 1. Fpileryogeal ("curringic laryus")
  - 1. Pyrisorm simus
- 5. Epiesphageal or Post Cricold (and Cervical suopheaus)
  - 4. Posterior and Lateral Walls.

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Table # 5

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	Total	E	Orton	a sala	Lede	mad	Gra	
el <sub>o</sub>	. oli	E.	No.		No.	7.	No.	site
27	185	41	53	21	88	30	39	Epilaryngeal
34	230	32	45	39	163	17	22	Pyriform sinus
31	214	1.7	24	34	144	36	46	Post cricoid
8	56	10	13	9	22	17	21	Post & Lat. Wall
	685		140		41.7		28	

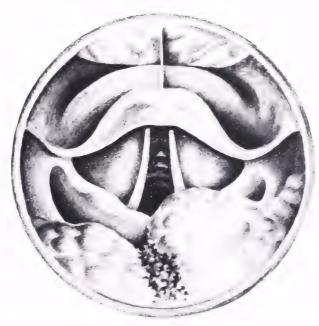


Fig. 278.—Laryngeal view of a carcinoma of the posterior wall of the laryngopharynx showing fissurelike ulceration surrounded by nodules.

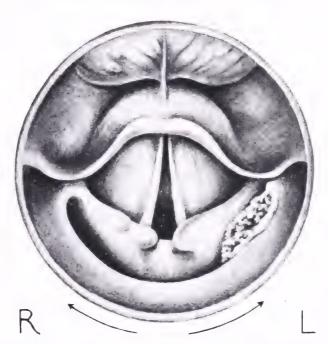


Fig. 279.—Carcinoma of the lateral wall of the piriform sinus without invasion of the larynx and showing only a slight edema of the arytenoid.

t



Fig. 280.—Mirror view of a carcinoma of the medial wall of the piriform smus showing considerable edema of the arytenoid and arytenoepiglottic fold and a tunefaction of the left false cord hiding the true cord. Because of the marked edema, these tumors are easily conjused with primary carcinomas of the endolarynx and are usually classified as such. Actually, the primary lesion is outside of the anatomic limits of the endolarynx.

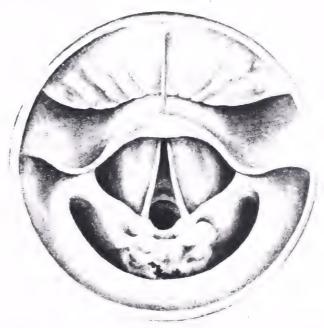


Fig. 281.—Mirror view of a carcinoma of the postericoid region. These tumors occur predominantly in women, although carcinomas of the laryngopharynx in women are not common.

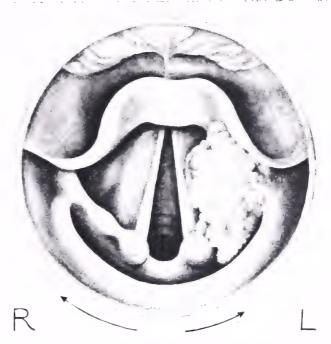


Fig. 282.—Mirror view of a carcinoma of the arytenoepiglottic fold, showing a typical exophytic growth extending over the laryngeal wall of the epiglottis and over the false cord, with some diminution of the movements of the larynx due to mechanical obstruction.

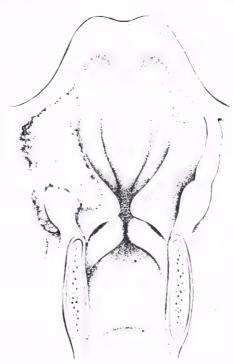


Fig. 283.—Posterior view of a carcinoma of the arytenoepiglottic fold of the preceding figure showing superficial extension to the epiglottis, arytenoid, piriform sinus, and false cord.

		ı

It will be noted that no group is listed in which the tumor was so extensive that primary site was impossible to determine. Figures of the cases from the New Haven Hospital are:

Table # 6

Primary lesion by Anatomic Classification: NHH series

	Trampay regress by this	**************************************	***	TATES SANDAMA
	Site	No.	7.	
1.	Epilaryngeal	7	13	
2.	Pyriform sinus	30	50	
3.	Post-cricoid	7	13	
4.	Post and Lat. Wall	3	5	
5.	?	12	19	
		59	100%	

Among all of these data (Non-Scandinavian) there is a predominence of the upper (1 + 2.) group which accounts for approximately 60% of all malignancies.

In the New Haven Group the incidence of pyriform class is higher. Among the "Lower Group" greater variation occurs; epiesophageal (postcricoid + cerv. esoph) accounts for 17, 34, and 36% in individual series with an average of 31%. The New Haven Series shows 13% which approximates only the 17% of Orton. The incidence of Posterior and Lateral Wall tumors is low in all series.

### 2. PATHOLOGY:

Epidermoid carcinoma is by far the most frequent malignancy in the hypopharync. The histologic section may show any degree of cell differentiation.

Ackerman and Regato state that the majority are undifferentiated. In a study of 70 autopsies performed on patients with malignancy of the hypopharynx and 71 cervical esophagus Wookey states that there was one adenocarcinoma and one basal-cell carcinoma. He goes on to say that there are structurally different tumors known as transitional cell carcinomas and lympho-epitheliomas. These types are highly anaplastic and radiosensitive. They may be merely variants of the more common keratinizing, more differentiated epidermoid carcinoma.

Wookey claims that in the latertype there was no metastases in 39% of cases, while only 8% of the anaplastic variety exhibited no metastases.

it will no noted that no joing is the at is which the beautius as alternion that primary size and the same the constraints. Figures of the raws from the Mew Haven Hospital are:

Primary logion by Apatomic Clareification: VMW coring

ESTREE NEW	HOTIDAT.	TICEDIA CIRCUIDAN	An morane Anomes	
	%	.011	Site	
	* 1	Ÿ	Isoprasii S	, <u>f</u>
	50	30	Pyriform sinus	2.
	i 1	2	Mastrarian'i	
	5	1 3	Post and Lat. Wal	4
	19	12	5	5.
	1001	59		

Among all of those data (Nam-Scartlinavian) there is a predominence of the upport (1 + 2.) group with accounte for oppositivately not us all mellumenates in the Rev Bayen froup the instituence of pyriform siems it digher. Though the instituence of pyriform siems it digher. Though the "Lover froup" greates worther on occurs, entenophanes (positivity) of the service many for it, 34, and 38; in institution entire mission of the results and series shows 13% which approximates only the LT of Great, the institution of sosterior and lateral with manys; is the institution of sosterior and lateral with manys; is the institution

# 2. PATHOLOGY:

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cervical acophagus sonkey states that willcomentations and one
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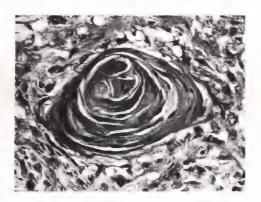


FIG. 261.—A microphotograph of a keratinizing carcinoma of the esophagus. ( > 200.)

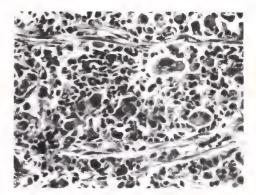


FIG. 262.—A microphotograph of an anaplastic carcinoma of the œsophagus. (> 150.)

One final malignancy deserves mention here; that is the lymphosarcoma which may arise from tonsillar tissue of lymphoid tissue elsewhere in the pharynx.

In the current series histologic diagnosis was made in all cases with the following results:

Table #7
Histologic diagnosis - all cases

Histology	No.	%	
Epidermoid Ca	54	91	
Anaplastic Ca	3	5	
Adenocarcinoma	1	2	
Lymphosarcoma	1_	2	
	59	100%	

Of 15 histologic specimens that were graded according to the degree of anaplasia, 14 were reported as Grade II and one as Grade III.

Description of the primary tumor is difficult probably because the tumor is usually seen late, after it has spread and lost its original appearance.

5,16,48

Some agreement is present in describing these lesions.

Three principle appearances are described: 1) A hand scirrhous infiltrating tumor; 2) A soft-spreading malignant ulcer; 3) A fungating or papillary form frequently spoken of as "cauliflower-like". Attempts have been made to correlate these types to specific anatomic sites, however, there is little agreement among writers.

## 3. STAGE

Beside Anatomic classification and histologic grading, staging of the tumor 33 provides further basis for assessing results of different methods of treatment.

Naturally many different methods of "staging" the degree of extension and metastasis of these tumors exist. The method that is found most practical in this clinic is the following:

Stage I. Local growth without extensions beyond the primary anatomical site.

Stage II. Tumor with extension from primary site to involve adjacent structures but without metastases.

One find: walignamey deserved vantion here: that is the trachorage way at set free tountlies the analysis.

In the durrent suddes histodoppe diagonals are made in all cares with the following results:

Table #7
Histologic diagnosis - all cases

	68	. oli	Histology
e grande see had appropriate the see of the first transfer to	91	26	Epidermoid Ca
	5	3	Anaplastic Ca
	2	1	Adenocarcinona
	2	1	S. COMBBONIANO
	100%	59	

Of is histologic spectures that were graded addording to the lugged of acapiasis, is were reported as fromis if and one as Greds III.

Description of the princey towns is difficult protein because the kulper is usually seem late, where it has opered as look like or trine; apparance.

Some agreement is present in descriptor than issuance.

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# 3. STAGE

Teside Ametoria classification and historia: gradin, single of the desire provides for the second continue of the second continue of the second continue of the second continue of these tames at the second continue of these tames are second continued that is the following:

Stage I. Local growth viceous exceptions be and the property with the stage of the property of

- Stage III. Primary tumor with local (cervical) metastases.
  - a. Without extension of tumor.
  - b. With local extension of tumor.

Stage IV. Distant metastases present.

Orton emphasizes that extension beyond the hypopharynx is a relatively late occurrence. However, early regional lymphatic spread is a very early 46 finding. Distant metastasis via the blood stream is a late manifestation. 52,76

Raven describes the direct extension of hyopharyngeal malignancy in four directions: 1) Vertically into the oropharynx where the tonsillar pillars, and base of the tongue may be involved, and into the cervical esophagus;

2) Anteriorly into the larynx and traches; 3) Laterally into the thyroid, internal jugular vein and corotid artery, in which case massive hemorrhage may result; 4) Posteriorly into the pre-vertebral tissues and cervical spine.

Lymphatic extension is frequent partially because of the rich network of vessels which converge toward the thyrohyoid membrane, pass through and terminate in the anterior and exterior nodes of the internal jugular vein. Beside the superficial cervical, upper and lower deep cervical, and submaxillary nodes, pre-laryngeal and pre-tracheal nodes may be involved.

The lungs and liver are the targets of distant hematogenous spread most frequently.

Data which is available from the literature in regard to percent of cases with node involvement and extension are quite varied; some of these data are summarized here.

Lymph no	de involve	ment	( To care. )	
	Scott & Mo	55		
23 %	Wookey 21	28		
33%	Hilger,	Kaplan		
40%	Turner 52,53			
50%	Raven 7	12		
50-75%	Carroll ,	Daly		

Stage fil. Pliabers comes with local (terstral) metastases a. Without extension of tumor. b. With local extension of tumor,

Stage IV. Distant metastases present.

Orton emphasers that extended hopord the hypophasyna is a resistivaly late occurrence. To sever, early regional lymphatic spaced is a very early 40 %.

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Raven sescribes the direct extraction of hyopharyngest malignancy in four directions: 1) Sertically into the propherynx where the consilian pillars, and base of the congue may be involved, and into the cervical scophague;

2) Anteriorly into the larynx and trackes, 3) Laterally lare the thyroid, internal jugalar vets and corotid arters, in which case massive humsinhage may result; 4) Posteriorly into the pre-venterial tissues and lervical agains.

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The lungs and liver are the targers of distant new regions of real most frequently.

Lata which is available from the literante in regard to percent of cases with node involvement and extension are quite verted, note of once out on sommerized here.

15-30% Scott & Moore
15-30% Scott & Moore
71
23 % Wookey
21 28
23% Hilger , Kaplan
66
40% Turner
52,53
50% Raven
7 12

33

Lederman breaks the node involvement down into the 4 classifications:

epilaryngeal	69%
pyriform sinus	75%
"epi-esophagus	45%
post and lat. wall	55%

Baclesse reports & 2% and 90% positive nodes in the upper and lower groups respectively.

In regard to extension, Turner reported fixed cord in 45%, Wookey

73

found adjacent extension in 54% of 70 autopsy specimens. Berven states

downward extension to levels of C-6 or 7 in 75%.

Among the cases in the New Haven series, there was extension in 45 or 75% at the time of diagnosis; there was cervical metastasis in 29 or 50%. Distant metastases were found 8 cases constituting 14%.

Staging was done according to the criteria listed above (page 17).

Table # 8

All cases - Staging of Primary tumors

	Stage	No	%	
I.	(local)	4	7	
II.	(extension)	18	30	
IIIa	(nodes)	2	4	
IIIb	(nodes and extensions)	27	45	
IV	(distant metastases)	8	14	
		<u>8</u> 59	100%	

Table # 9

All cases according to Site and Stage

Site			Sta	ge		
	I	II	IIIa	IIIb	IV	Total
Epiglottis	1	ets.	-	100		1
Aryepiglottis	***	**	**	1	2	3
Arytenoid	-	1	460	1.	1	3
Pyriform sinus	1	9	2	15	3	30
Post Cricoid	460	5	400	1	1	3
Post & Lat. Wall	1	1	160	1		3
?	1	2	one .	8	. 1	12
	4	18	2	27	8	59

3.5

ledenme stank the aude town remark down into the a classifications.

X: 0	ep.1) armrea:
7.8. 6	P\$0.47 4 5.03423 5
45%	"epi-esophagus
55%	liaw Bost and lat. wall

escites reports Il sua PII postive acted in the apper and invertiones

furegrand to the teaston, luthest reported fixed conditions of the Sound Softward antension to levels of G-6 or 7 in 75%.

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Staging van tore according to the criteria lieted above grage ).

Table # 8
All cases - Staging of Frimary tumors

	THE STATE OF THE S	
4	£	I. (local)
30	18	II. (extension)
gh	2	IIIa (aodes) salli
54	27	IIIb (nodes and extensions)
14	<u>8</u> 59	IV (distant metastases)

Table # 9
All cases according to Site and Stage

		50	1623			Site
		1 2		2 2 2 mm	20	
1	000	20	199	0	I	Epiglottis
3	2	1	•	to the second	-	Aryepiglottis
3	1	1	· gin	1	400	Arytenoid
30	3	15	2	. 8	1	Pyriform sinus
3	1	1	-	5	400	Post Cricoid
3	60	1	000	1	1	Post & Lat. Wall
12	1	8	60	2	1	\$
59	8	27	2	18	4	

# 4. SIZE

One final factor which may aid in determining prognosis is size of the 27 lesion. Jacobsson states that in a series of 322 cases 45% had lesions in excess of 5 cm. of the present 59 cases only 5 were less than 2 cm., and in 12 cases no information was available.

40 7 ,...

One final sector with two is in determine, so the mis of the less of the less of the present St case in the present St cases of 5 cm. of the present St cases unly 2 ears teld then 1 = 1 and the 12 cases no information was available.

HISTORY

Before discussing some of the more important current therapeutic concepts of hypopharyngeal malignancy, a few words about the historical aspect of therapy of hypopharyngeal malignancy may be in order.

#### 1. SURGERY

The laryngopharynx being the "point" of juncture" between the respiratory and digestive tracts has two traceable historical approaches. Laryngectomy and other operations on the larynx itself provided an early approach to tumors of the "extrinsic larynx" or epilarynx as well as those of the "intrinsic larynx" or endolarynx. Billroth is credited (among many other accomplishments) with the first excision of the larynx in 1874. Operative mortality in this early period was discouraging: thyrotomy (10-20%), hemilaryngectomy (26-35%) and total laryngectomy (47-60%) so that Butlin stated in 1887 "there seems to be scarcely justification for performance of a radical operation for cancer in this area". Endolaryngeal cancer has since been successfully controlled by the surgeon so that results today are: thyrotomy (85-95% cures)., total laryngectomy (60-90% cures), depending on site); concomitantly, operative mortality has fallen to 1.9-4.3%. Surgery has made far less striking advances in carcinoma of the epilaryngeal sites.

But first let me trace the second of the two approaches which I mentioned earlier. This dates back to approximately the same time as laryngeal surgery. Vienna was the place and two of Billroth's students performed operations on the cervical esophagus; Czerny in 1874 performed the first excision of the cervical esophagus with a permanent esophagostomy. In 1884 vonWikulicz excised the cervical esophagus and performed a skin flap restoration of continuity. Both patients died of recurrent disease within 2 years. By 1900 14 such operations 13,38 were reported (deQuervain, cited in ) recurrence was the rule with 5 operative deaths. vonHacker reported the first successful amcision of larynx, cervical esophagus, and lower pharynx in 1908. This was perhaps the end of the

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first period which was characterized by early attempts at radical surgery.

Operative mortality was extremely high evidenced by the few figures quoted.

Most cases were marked either by post-operative death from innumerable complications or recurrence with eventual death from the malignancy.

Wilfred Trotter in his Hunterian Lecture of 1913 offered several refinements of the overall surgical outlook on the problem of cancer of the pharynx. His accounts of the incidence and natural history of the disease are as valid today as then, and this single presentation is generally regarded as the foundation of this field.

Where earlier surgeons were concerned only with the removal of an anatomic structure such as the larynx or a major subdivision such as the cervical esophagus, Trotter emphasized that "the whole basis of operative surgery has changed and 58 the nature of the operation is determined by pathological considerations"

Thus the exposure must be capable of extension as the extent of the tumor is determined and removal must be regulated by the "pathological necessities" of the the case. Nodal involvement was a very important factor in determining operability. The dissection performed by Trotter was more extensive than before-dissection of both sides when "early" bilateral nodes were present; and deep dissection with removal of sternomastoid and internal jugular together with all fat and connective tissue when extensive nodes were found. In this latter case, later dissection of the opposite side may or may not be done.

If these principles appear more radical than those practiced earlier such was not the case for Trotter's operation for removal of the primary growth was the lateral transthyroid pharyngotomy by which the pharynx is exposed laterally (thyroid having been reflected forward and the ala of the thyroid cartilage having been divided) and incized vertically with excision of the tumor and closure. Pyriform sinus and epilaryngeal tumors were less curable than lateral wall tumors and Postcricoid and Posterior wall tumors were least amenable

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of all, because plastic reconstitution of the wall with a skin pedicle was necessary. Conditions were still operable when nodal involvement was "limited" and when the primary was still within the pharyngeal wall. Thus, Trotter deviated from the earlier radical surgery, which had been marked by the "danger of operation and the distressing convalescence; and the mutilation 58 and disability left by an operation otherwise perfectly successful".

These principles as expounded by Wilfred Trotter were to influence the entire field of hypopharyngeal surgery for the next 30 years except for minor 62 variations. Admittedly this type of surgery had few proponents, but those who did treat carcinoma of the hypopharynx surgically adhered to these principles.

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9
Pélcher and Colledge in England did so; Pilcher, however, advocated pharyngolaryngectomy with neck dissection in cases of tumors of the pyriform sinus. Whereas these tumors had been poorly treated by Trotter's method Pilcher could report 6 cures of of 16 patients treated by pharyngolaryngectomy with plastic repair of the pharynx.

During this same period Orton was a proponent of radical excision in this country. His cases were those of tumors of the endolarynx as well as the hypopharynx proper. In 1930 Orton first introduced the lateral pharyngotomy 41,42,43,44 to the American literature . As an Otolaryngologist with extensive experience in the extirpative treatment of tumors of the endolarynx it was only natural that he apply the techniques of laryngopharyngectomy to tumors invading the laryngeal orifice and to advanced post-circoid tumors which had 45 invaded the laryngeal cartilages. In brief, Orton\*s method are the following:

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Lateral Pharyngotomy - upper epiglottic lesion

early aryepiglottic fold Posterior and Lateral Wall

early Post-cricoid base of epiglottis

extensive aryepiglottic fold

pyriform sinus.

Laryngopharyngectomy: Advanced post cricoid.

Following laryngectomy or laryngopharyngectomy Orton reports 68 5 yr. survivals out of 220 operations (31%); following 17 lateral pharyngotomies he reports 4 5 yr.

45

survivals (24%).

#### 2. RADIOLOGY

Laryngectomy:

During this middle period of surgical treatment, radiology had made some progress from its earlies days when local radium was the treatment of choice. Little information is available concerning this early period. Trotter in 1931 62 conceded that there was use for this method in treating post-cricoid tumors which demanded extensive reconstructive measures when treated surgically. However, he would be the last to admit that radium had simplified treatment. He felt that many patients who may have had a chance of cure by surgery were losing that chance. At the present time local radium is seldom used in carcinoma of the 25 hypopharynx.

Chutard at the Curie Institute in Paris was responsible for the widespread use of x-radiation in this area. It was here that the basis of intensive, protracted fractional x-ray treatment was established. The skin dosage was high - in the vicinity of 7000 r to 8000r and the period was at first relatively short (16-40 days) In practically all of these early patients severe cutaneous reactions and muscular and deep tissue sclerosis occurred. Of patients treated 1932-3 Coutard later reported a 50% 5 year cure (4/8). Zuppinger in Zurich with a similar plan reported in 1934 an absolute 2½ - 5 yr. cure of 11%. (period of  $\frac{9}{12}$ x was less than 30 days). Zuppinger concluded that radiation was "the treatment of choice in all malignant tumors of the epi-, naso, and hypopharynx"

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survivals (24%).

### 2. RADIOLOGY

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Operand at the Ourse Institute to Yorks our enquirelle Ing the vicinginal use of regaliation to this area, it was bore that the call all countries and n - t &: the distance of the d high - in the elitates of 7000 a to 2000; and the person out trace relectfully short (16-40 down in practically all of their mint, per min mintro about on included the contract of the c 1931-5 Course takes suppressed a 500 | years sugge (A/V ), Hypings or mulch with a similar plum reported in 1910 an abacidia Th - I ye cure of lift. (next)od of as was less than 30 whys). Depiteges come alof the multiplying web "the transment of delce is all sufficent board of the mile, and, and longpharynx" The survival rates cited, especially that of Coutard (1932-3) are both substantially above the results of radiotherapy reported in all other contemporary series. In addition radiation reactions plagued the patients. Baclesse in 1949 published his modifications of the protracted fractionation method of Coutard. Intense reactions were reduced by temporarily stopping treatment if signs should appear, meanwhile continuing tangential radiation of the lymph nodes. The total skin dose could be increased by; 1) reducing size of fields, 2) treating lymph nodes tangentially, and 3) by prolonging treatment to as long as 12 weeks. Reduction of daily dosage and rolation of fields aided in diminishing reactions which Baclesse determined occurred at fairly definite intervals. Site and extent of the lesion, presence of positive nodes, and regression during treatment determine the "most effective total dose with fractionation".

The Radiumhemmet in Stockholm became one of the leading centers of radiotherapy in the years following 1930. Teleradium or" radium bomb" was used in smaller, well demarcated tumors without nodes. X-ray was used in more extensive 1 cases. Ahlbom reported 6% cure in 150 cases. Four field were used instead of Coutard's two, and radiation was measured as tumor dose - 5000-6000r tumor dose being employed protracted over 20-30 days. Although no routine by which all patients would receive a specific dose was followed, the workers at the Radiumhemmet revealed that it is necessary to keep the tumor dose above a certain level if the chance of cure is to be appreciable. Ahlborn felt that this lower limit was 5000r. In contradistinction to Coutard's method this was fractional but not protracted radiation.

Jacobsson stated in 1951 that the three main factors influencing treatment results were: 1) Roentgen treatment with tumor dose of 5700-6200r over 26-30 days. 2) Metastases - "cases with metastases seldom can be permanently cured". Primary and metastases may disappear affording a 3-4 year survival. 3) Appearance of second primary tumor. Jacobsson reviewed the results as published in the literature up to 1951:

The purvival caces cited, superially that of Coutact (1935-3) are both substantially where the results of Laddath early species. In addition radiation results of the precised in actions. Deless in 1948 published his modifications of the precised franctionarion winds of Coutact. Intense tractions were reposed by Composed in accepting traction winds of aligns should appear, measured to continue to the species of the ladds. The fulational sale continues to the continues. The fulation of the sale of the ladds, ander, The fulation of anily to intraces by it remains also of the ladds, long as 12 weeks. Padattion of anily downers and resting to the sale of the ladds of the sale of the ladds and extent at the ladde, and the ladds and extent at the ladde, presented of the ladds and extent at the ladder, presented of politice modes, and extent of the "east of resting the sale and extent at the ladder, presented of politice modes, and extention during the stream and stand of the "east of the ladder. Stream of the sale of

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Table # 10

Radiologic results - 7 series

C	ountry	No. cases	% 5 yr. cure
England	(Cade 1949)	40	7
Finland	(Sipila 1949)	172	8
France	(Bacless 1949)	425	. 6
Germany	(Glauner 1949)	112	3
Ireland	(Douglass 1950)	. 77	6.5
Norway	(Rennaes 1949)	84	7
Sweden	(Jacobsson 1950)	84	14 *

Jacobsson's series included cure rates of 10% for the upper group of lesions and 17% for lower (post cricoid and posterior & lateral wall) tumors.

Hultberg reported an overall 14.5% \* cure rate in 1954 from the Radiumhermet using the fractionated but not protracted method of Jacobsson with roation of beam then 3 primary fields: 2 lateral and one anterior with careful avoidance of the spinal cord. These results represent the highest cure rates reported in the European literature.

<sup>\*</sup> relative cure rate -(absolute cure rate 12.3%)

Table # 10
Radiologic results - 7 series

	40100	
	(Cade 1949)	England
172 8	(Sipila 19q	Pinland
425 6	(Bacless 19	France
2 (84)	el remable	grasman
1950) 77 6.5	(Douglass 1	Ireland
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1950) 84 14 *	(Jacobsson	Sweden

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#### 1. Present Concepts of X-ray Therapy

Radiation has provided little more than palliative results in the great majority of cases as revealed by the figures in table 10. Some of the major advanced have been traced in formation of current concepts of radiation treatment of carcinoma of the hypopharynx.

One of the first problems that faces the therapist is which cases to treat and which are essentially not amenable to therapy. Naturally the therapist would prefer the localized, non-metastasized tumors; however, these are also the cases which are sought by the surgeon. The majority of radiological attempts are in cases with a tumor which has already extended within the pharynx or into the larynx; in addition many cases exhibit local, cervical, palpable metastases. In the latter case irradiation, of course may be supplemented by neck dissection. Patients who exhibit distant metastases are usually considered hopeless and radiation can only provide a palliative result.

A second consideration is the site of the primary tumor when localized.

31

Lampe quotes 5 yr. cures in epiglottic and vallecular malignancies in the

8 range of 16% to 32%. Aryepiglottic fold tumors vary in response according
to position, the better prognosis being in those that arise nearer the epiglottis.

Pyriform sinus lesions being infiltrative, result in only isolated cures. Thus,
the upper group provides a varying prognosis depending on site, size, and
metastases; likewise the lower group. In the pharyngeal wall tumors localization
may result in good prognosis, however, the postcricoid group is notoriously
dangerous because of invasion.

Several technical factors enter into these considerations. At present, x-radiation is used almost exclusively rather than radium. Tumor doses are generally over 5000 r and the duration is not protracted excessively. Radiation of as small a tissue volume as possible is essential with avoidance of vital

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Description of the fingt problem that is an energial to the recipies to relate and which are some mility to the regular would profes the localised, not enquired to the respective of the second which are enought by the suggests. The second which are enought by the suggests. The second which are holding to pharms attempts are is easier with a terms which has already colonised which the pharms or laborable that are largest, to militian many count would be all consider an explaint and settless and the largest case itradiation, at course are to plant and by need distant who satisfies a paintagive and admits considered.

A second condidensation is the site of the jetting into them to critical, or restee 3 pr. dures in spillostic and validables rallinosed of in the range of 12% as 32%. Asymptotics and course very in corpones according to position, the better proceeds rotag in those that acts market he applicable typicars athor instant rational ration. I and the unity totalises into the spillostic the upper array provides a varying procedura depending on airs, size, and was asless; liberize the lever group. In the planting on airs, size, and may though a good prognouss, however, the nochtasional group is notational.

Saveral sechnical factors rates throughout considerations as a readily that is seen a summan for a summan is seen a since the contract the contract of the con

structures such as the spinal cord. Multiple ports are used and accurate direction of the beam is important. At the Radiumhemmet fluoroscopy is used to direct the beam. One month is the theoretical duration of the course of treatment.

Results reported in recent series of radiologically treated cases include

25 68

the 14.5% of 5 yr. cure of Hultberg in 1953. Welin claimed 17% cure at

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the Radiumhemmet in the same year, whereas Lederman reported 13% 5 yr. cure

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in 1954, in England. Harris in this contry reported a series of malignancies

of the larynx and laryngopharynx. In 103 cases of laryngopharynx including

lesions of the epiglottis and of the false cords, he claim a 5 yr. cure of

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35%. The latest report is that of Wang who obtained cures in 18% of 150

cases. His grouping of lesions is unorthodox so that comparison of groups

is difficult, however, survival of patients with anterior lesions (epiglottis

etc) is much higher (31%) as is that of patients without metastases (29%).

Only 8% of cases with metastases were cured.

At the Grace-New Haven Community Hospital radiotherapy has undergone many changes over the period which the present series represents. At present most cases treated have local extension of the lesion and/or cervical metastases. These metastases may be secondarily (or primarily) radiated or a secondary dissection may be performed. Cases with distant metastases are only amenable to palliative treatment.

Tumor dose between 5000r and 6500r is the goal within 6-7 weeks. Multiple small ports are used, the largest being 6 x 8 cm. Usually 4 ports are used - aim being avoidance of the spinal cord. Rotational therapy may be used.

#### 2. Current Concepts of Surgical Treatment

In tracing some of the more important events in the history of treatment of this disease, several general trends have been mentioned. The first was that originated by the surgical advances of Trotter.

structures such as the spinel cord. Multiple ports are used and acrimace direction of the mean is important. At the Padlathuract Phonoscopy is used to direct the seas. One month is the theoretical derection in the caster of transment.

Secults reported in recent series of radiologically transited cases include the 14.5% of 5 yr, ture of Pultrer in 1955. Velim claimed IX cuts at 33 che Radiumboumet in the same year, whereas lederman reported 15% byr, ourse in 1954, in England. Harris in this contry reported a series of salignancies of the laryest and laryespectarys. In 160 sames of laryespectary and laryespectation of the folias corta, he cicles 5 yr, come of 65%. The lateau report is that of Mang who clasimed curse is the of 150 cases. His grouping of lesions is unorthoder so that comparison of groups is difficult, nowever, servival of parteurs with anterior lesions (apiglottis atc) is much higher (31%) as is that of parteurs without metascases (25%).

At the Grace-Wev Haves Community Respital radiocheracy has undergone many changes over the period which the present series represents. At present most cases treated have local extension of the lesion and/or cervical micasiness.

These merastases may be secondarily (or primarily) radiated or a secondary dissection may be performed. Gauss with distant retastases are only admistly to palliative treatment.

Tumor dose patwern 5 Mur and 6500r is the goal within orl weeks. Suitiple awall ports are used, the largest being a s 8 cm. Benelly & ports or used - alm being avoidance of the spinal cord. Potational therepy may be used.

#### 2. Current Concests of Surcival Treatment

In tracing some of the more important evants in the history of treatment of this disease, several gaueral trands have been mentioned. The first was that originated by the surgical advances of Trotter.

Later radiologic advances were hopefully regarded partially because of the more conservative approach. However, results were never spectacular or even rewarding; therefore the past decade has experienced the redevelopment of the 38 radical surgical approach to the problem. In another sense, as Missal states: "The terms conservative and radical surgery should be discarded when one thinks and speaks of cancer surgery". He propeses instead the terms adequate and inadequate. Adequate surgery is defined as removal of all tumor cells known to be present in the body.

Advances in the adjuvants of surgery, anesthesia, parenteral medications, fluids and foods, and the recent antibiotics have encouraged the return to surgical management of carcinoma of the hypopharynx. The result of such improvements has been the reduction of the risk which naturally attends any procedure of this complexity.

As effective curative procedures are established the problem of determining the advisability of operating on any particular patient becomes increasingly important. Many criteria of operability are found in the literature, the following are examples.

53 49

Raven and Owen stress the importance of extension of the primary growth 24 in assaying operability while Horwitz et al emphasize the node involvement and metastatic spread. In general there are 5 considerations in determining operability. 1) The degree of dysphagia and other symptoms of obstruction 49 are mentioned by one writer as contributory. 2) The extent of tumor growth is important; the primary with lateral extension into the neck and fixation is obviously not desirable. The encroachment on vital structures such as the larynx and vocal cords (or recurrent laryngeal nerve) and the degree of growth upward into the oropharynx, downward into the cervical esophagus, and posteriorly into the prevertebral tissues are all considered. 3) Lymph nodes are a major

Later radiology: edvances are boyefully rejuded precisity secures of the more conservative approach. Orways, resides were naves uporthouses or even resemble; therefore the mail draws as securizated the restratopass of the mail draws as each tenced the restratopass of the rational and the restratoral and the profession of the profession and speaks of conservative and soldies anapare; should be the term of the one time and speaks of conservative and the following the term of the term of the term and the busy of the term of the term of the term of the precision of the term of term o

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factor; immobile hard cervical nodes are considered a contraindiction by Raven and others. 4) Distant metastases are of course considered a contraindiction to surgical therapy, the chief targets being pulmonary and distant gastrointestinal sites. 5) As in any major surgical undertaking the general condition of the patient must be weighed.

In those patients who are treated principally by surgery there are two areas of attack: the site of the primary growth and the cervical lymph nodes if present. When the nodes are clinically negative the primary may be resected with or without subsequent node dissection. A prophylactic unilateral neck dissection may be performed embloc at the time of resection. A discussion of some of the methods of primary resection follows.

The oldest of the procedures is the lateral transthyroid pharyngotomy first described by Trotter. In selected patients the laynx may this be preserved.

This approach has several inherent advantages in that there is good exposure for block dissection of lymph nodes, and in addition it is a flexible enough approach to permit more radical excision of pharynx and larynx if the lesion is seen to so demand. Perhaps the principle indications for pharyngotomy are 1) localized aryepiglottic fold lesion well removed from laryngeal inlet. 2) Limited growth of lateral pharyngeal wall away from laryngeal inlet. 3) Posterior wall lesion without extension. 4) Some surgeons consider post-cricoid growths in a very early stage as amenable to this procedure. Others exclude all post cricoid as well as all pyriform sinus growths from the pharyngotomy group.

Basically the operation consists of a skin incision in the form of a flap in case radical excision is performed and flap reconstruction of pharynx is necessary. The strap muscles and thyroid are reflected after preliminary tracheotomy; deep vessels are exposed and external jugular is ligated and resected. The horn of the hyoid and ala of the thyroid cartilage are removed. When the site of the tumor is determined a vertical incision is made in the pharyngeal wall,

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Totaching the operation consists of a white includes the form of a flag in case that it cases the succession of the acceptance is succession of the acceptance of the acceptance and acceptance is successful that it is categories and acceptance of the acceptance of th

and dissection of the primary tumor is done with margins or at least 1 cm. of uninvolved pharyngeal tissue on all sides. If pharyngeal resection is limited the mucosa may be closed primarily otherwise the flap must be utilized to reconstruct, either wholely or partially, the pharynx. Morfit states that "neck dissection is done (concomitantly) regardless of whether there is clinical evidence of cervical metastases or not".

The second major surgical procedure is the pharyngolaryngectomy with skin flap reconstruction which is being used more widely today than ever before. The operation was originally devised by Wookey in 1948 and bears his name. Of the reports of surgical therapy appearing in the literature in the last 3 years almost 6,11,18,19,24, all deal with this more radical operation or modifications of it 26,28,38

This procedure is most useful in malignancies of the epilaryngeal structures where there is involvement of the laryngeal inlet. Extensive pyriform sinus lesions where there is usually infiltration of both the inner and outer walls of the sinus and most post-cricoid cancers where there is extensive involvement of the post laryngeal cricoid cartilage both demand this more extensive operation.

To describe the principles of the Wookey procedure: The skin incision is designed so the flap may be utilized in pharyngeal reconstruction. After the strap muscles are removed and the thyroid gland divided, the trachea is divided. Laryngectomy is carried out and then adequate pharyngectomy. The skin flap is laid across the prevertebral fascia, sewed to the inferoposterior edge of the oropharynx above and esophagus below, turned on itself and sutured to anterior margins. The resultant fissure reconstruction is closed at a subsequent operation producing a completed skin-lined pharynx. An operation of somewhat less 71 radical nature is described by Wookey whereby the larynx is preserved but entire lower pharynx removed with skin flap reconstruction. This is reserved for less extensive post cricoid and pharyngeal wall lesions where there is no direct involvement of the larynx or its cartilages.

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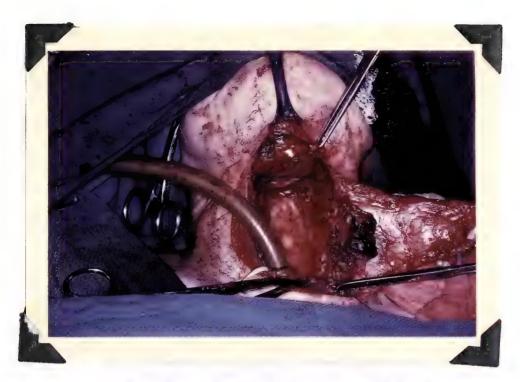


Wookey Opreation: skin incision so that skinflap may be utilized in pharynx reconstruction.



Stage 2: After removal of strap muscles an division of thyroid, the trachea is divided. Endotracheal tubeis in the distal stump.

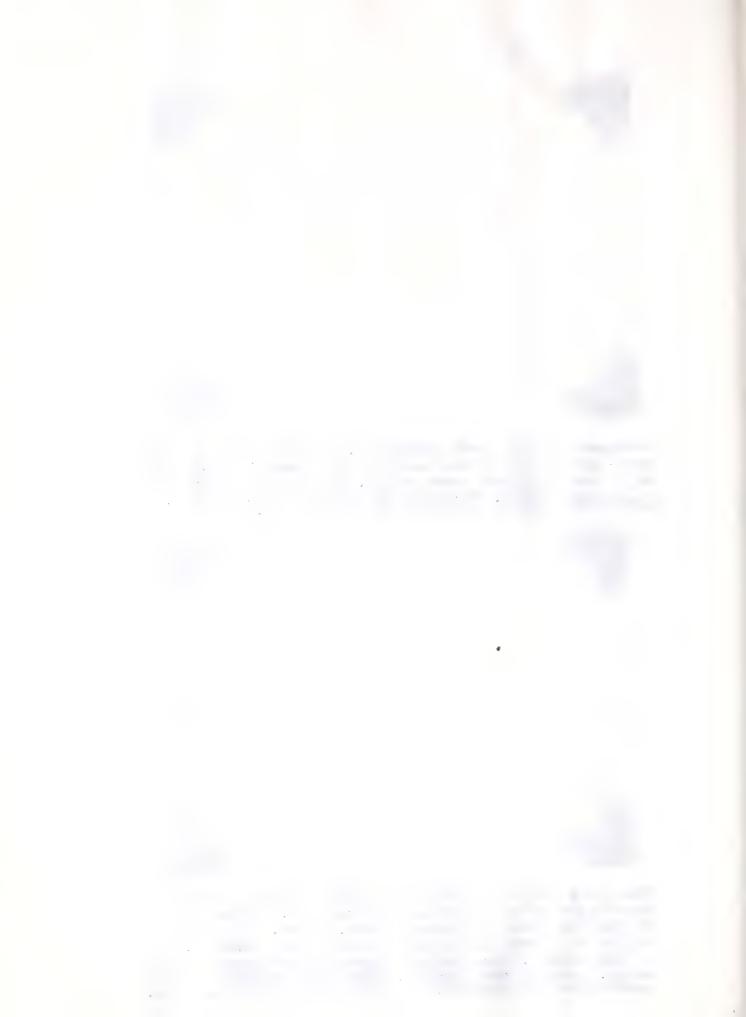


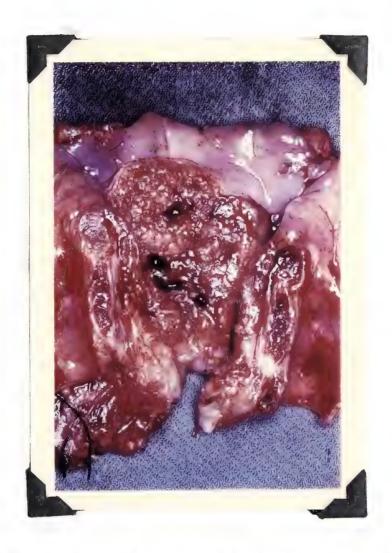


Laryngectomy has been completed, as well as pharyngectomy - pharynx has been severed from cervical esophagus below and floor of mouth above. Opening to oropharynx is visible above. Prevertebral fascia is posterior. Reflected skin flap is seen at right side.



Skin flap has been laid across prevertebral faccia from right to left and sutured to post. surface of oropharynx above and cerv. esoph. below. It is then folded on itself and sutured to anterior sufaces. A "skin-lined, open gullet" then connects mouth and esoph. (gastric tube shown). Remaining exposed areas arecovered with grafts. "Gullet" closed subsequently.





Surgical speciment The cricoid cartilage of the larynx (posterior wall) has been split vertically revealing the lumen of the post-cricoid region of the hypopharynx. 3-4 cm. friable growth is obvious on the post. pharyngeal wall. Not shown is the alost complete encirclement of the pharyngeal wall by tumor, so that it encroached upon the cricoid cartilages shown.



Radical neck dissection as a prophylactic measure on the side of maximum involvement is a procedure of increasing popularity. Because of the high 7,12,28 incidence of early nodal involvement (50-75% of cases); the so called enbloc procedure may be utilized with radical dissection of opposite side if positive nodes should appear later. Enen this radical enbloc dissection is considered too conservative for some surgeons who advocate bilateral dissection in continuity with primary excision in cases with tumors crossing the midline.

57

At any rate, as Snitman and Horowitz state en-bloc dissection appears to be "the cornerstone of cancer surgery".

Many of the modifications in operation deal with embloc dissection of cervical modes; however, some alter the method of pharyngeal reconstruction.

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Conley and Edgerton favor an immediate reconstruction of the pharyngeal defect with a tantalum wire mesh or nylon stent over which thick, split, free skin graft has been positioned. Earlier attempts of reconstruction with only the free skin tube resulted in frequent stemosis. These writers feel that such immediate, one-stage procedures are superior to those "encumbered by the delayed multiple stage reconstruction of the pharynx" by cervical skin flaps or by the method of tube pedicle repair. This latter method utilized a neck-based, skinlined, tubed pedicle and has been used by Bricker and Burford of St. Louis in repair of the cervical esophagus; it is, as has been noted, a multiple stage procedure.

Since most of these methods of surgical therapy are relatively recent very little material is available for 5 year studies. The available figures are presented in table form.

Fraise and ulisection of prophylactic neigure on the side of omputational townshapened to a procedure of theresided populative, the main that descript and at the transfer of early model toyofvenat (50-7% of early)

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Presented in table form.

Table # 11
Surgical Results: 8 series

Series	Cases	PO death	Period	% Surv.
Graham '42				
Laryngx phar. excis. Orton '48	15	27%	15-24 mos.	16%
Lat. pharyngotomy or phar				
yngolaryngect with or without ND	80		5 yr.	30%
Owen '50				
Lat. pharyngotomy or	22	25%	5 yr.	18%
Pharyngolaryngectomy	14	23/9		14%
Dunlop '52				
Lat. phar. or phar-laryng	<b>x</b> 20	5%	2 yr.	25%
Raven '54				
enbloc procedure	23		2 yr.	22%
Kaplan '54				
laryng & partial pharyng	¥ 4		(5 yr. (3 yr.	50%
with embloc dissection			(3 yr.	50%
Hadfield '55				
Phar-laryngx	24	37.5%	2 yrs.	37.5%
- 4			3 yrs.	21%
Grimes '56				
Radical with bilat ND	25	20%	3 yrs.	32%

Admittedly, these figures, limited as they are to both number of cases and period of observation, are hardly significant. The 3yr. survival is in the range of 21% to 50%, and the 5 yr. survival between 14% - 50%.

At the Grace New Haven Community Hospital there were 59 cases between 1940 and 1957. Included in a 3 yr. period of observation are 46, 8 of whom have survived - a 3 yr. survival of 17.5%, 40 are in the 5 yr. study, 6 surviving 5 or more years - 15%. In the 5 year group only 3 underwent radical surgery:

1 Wookey operation for post cricoid cancer and 2 lateral pharyngotomies for pharyngeal wall and pyriform sinus growths. Of these 2 survive 5 years or longer (66.6%). Four other radical excisions were performed including 2 pharyngolaryngectomies, one with a Wookey reconstinction, one with first skin graft. These patients have survived 2,30,32 and 34 months.

The following table relates the method of therapy to the number of cures in the 5 yr. group.

THE REPORT OF THE PROPERTY.

. VIUE Z	Period	PO death	Cases
162	15-24 mos.	27%	Graham '42 Laryngk phar. excls. 15
30%	.3 yz.		Lat. pharyngotomy or phar yngolaryngect with or 80 without the
18%	. TY E	.652	Lat. pharyngotomy or 22 Pharyngoladyngestomy Ounley '52
2.5%	- to 13	or t	Let, phas. or prarelaryman, 16 Raven '54
22%	2 yr.		enbloc procedure 23 Kapian '54
302 502	i yr.		larvnik & paretal pharynik & with embloc dissection Hadfield '55
37.5%	2 775.	37.5%	Phar-laryngx 24
21%	3 yrs.	20%	Grisma '56 Radical with bilat ND 25

Admittedly, these ligares, traited as they are to bett used of races are period of object/subles, as hardly significant. The Byr. supplication to the races of like to 50%, and the 5 yr. supplies through a 14% - 50%.

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1 Woodely operation T v post literia unit 5 istoral pherysprounts for pharyspaced well and pyrifies sinus growths. Of these recruive 5 years or languar (40.6%). Tous other radical exclutions were surfaced including 1 pharyspaced as a model and and pharyspaced as a model of the surfaced including 1 pharyspaced as a model of the companies of the surfaced and and the surfaced and surfa

The following table calors its action of the root on the mater of contain the 5 yr. group.

Table # 12

# Type of Therapy and Results - 40 cases

#### included in 5 yr. follow-up

Therapy	No. d. less than 5 yr.	Surv. 5 yr.	%
Radiation	20	3 )	12.5
Radiation & Pall surg.	8	1 }	
Primary excision	1	2	66.6
Pall surg.	1	, <del></del>	-
No. therapy	4	-	-
	34	6	15%

In the four tables that follow I have related the various prognostic criteria individually to the number and % of cures; again only the 5 yr. group is included.

Table # 13
Site of Primary and 5 yr. cure

Site	No. d. less than 5 yr.	Surv. 5 yr.
Epilaryngeal	3	
Pyriform sinus	21	2
Post Cricoid	2	1
Post & Lat Walls	2	*
?	6	

Table # 14

#### Size of Primary and 5 yr. Cure

Size	No. d. less than 5 yr.	Surv. 5 yr.
less than 2 cm.	1	
greater than 2 cm.	27	4
?	6_	2
	34	6

### Table # 15

#### Stage of Primary and Cure.

Stage	No. d. less than 5 yr.	Surv. 5 yr.
I	1	1
II	12	3
IIIa	1	40
IIIb	15	2
IA	5 34	6

#### Table \$ 12

#### Type of Therapy and Results - 40 cases

### included in 5 yr. follow-up

Ç®	. to 2 (1998)	Per o Less chan 5 vs.	constr-
12.5	( )	OZ	nozzażon
,		8	Radiation & Pall. surg.
66.6	2	1	Primary excision
0.00	79	1	Pall surg.
		ga .	No. Charleyy
en die die de	à	34	

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Site of Frimary and 5 yr. cure

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	. 6	Epilaryngeal
6	22	Pyriform sinus
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-	2	Post & Lat Walls
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## Size of Primary and 5 yr. Cure

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1	less than 2 cm.
27	greater than 2 cm.
0	?
34	
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### Stage of Primary and Cure.

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4		1
-	7	9111
1	2.1	27XX
-4	24	

Table # 16.

## Duration of Symptoms (PTA) and Cure

Duration (months	No. d. less than 5 yr.	Surv. 5 yrs.
3	11	4
6	15	1
9	2	-
12	4	1
18	1	
24	1.	Official
	34	6

## Table # 17

Cause of deaths	All cases	
Cancer - larynx or pharynx )	22	
Cancer - larynx or pharynx ) Hemorrhage 20 to 10 10 11	5	
Extensive Cancer	5	
Coronary Throm.	1	
As CVD	1	
Tbc	2	
Pneumonitis	1	
?	10	

Table # 16.

# Duration of Symptoms (PTA) and Cure

Par de maria	No. d. loss than 5 yr.	Duration (months
parties public and a second se	P. P.	e
r.	21.	9
	2	A
i	& .	2.1
-	<u> </u>	24
Control of	34	🕶

### Table # 17

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22 5 5 1 1 2	Cancer - largex or pharyant ) Remorrhage 2 to " " ) Extensive Cancer Coronary Thron. As CVD The
01	5

## CONCLUSIONS

The hypopharynx is more than an esoteric anatomical subdivision of the upper gastrointestinal and respiratory tracts; it not infrequently is the site of an extremely lethal carcinoma. This tumor is remarkably "silent" as has been shown by the advanced stage of most cases at the time of diagnosis. In addition to local extension many cases present with regional metastases (approx 25-50%) a cervical mass being a frequent initial symptom.

To state that early diagnosis is requisite to an improved cure rate is to repeat what has been urged by many who are actively engaged in treatment of the disease. Many of the initial symptoms are vague enough to be overlooked even by the most alert patient; however when the middle aged patient does seek medical attention for abnormal pain in the retrohyoid region or complains of hoarseness or dysphagia or even cervical mass, no workup should be considered complete without direct exam of pharynx, mirror exam of the larynx and hypopharynx, direct laryngoscopy, and barium swallow.

Clarification of the nomenclature and standardizations of the classification of these tumors are importative so that accurate anatomic diagnosis may be made and effective therapy promptly initiated. In order that different therapeutic means may be intelligently compared, proper classification and description in terms of site, stage, histology, and size are necessary.

Today, in the midst of numerous reports acclaiming the results of diverse methods of therapy, perhaps a look at what has been done up to the present is in order. Certain facts are evident: radiology, much advanced as it is in some fields, has not offered more than 18% cure in any series, most being in the 10-15% range. Surgery has progressed from its earlier avoidance of "mutilating" laryngectomy and radical procedures to the point where wide excision of primary growth and embloc dissection to varying degrees is routine. The Pharyngo-laryngectomy with flap reconstruction of gullet (Wookey procedure) is typical.

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Results of the radical "adequate" surgery are extremely difficult to evaluate because 1) few 5 yr. results have been published; 2) little attention is paid to precise anatomic classification. The few reports available enable a more optimistic outlook toward the overall problem; however, new problems arise in regard to the selection of proper patients for surgery. The prognostic criteria mentioned above: site, stage, histology and size assume renewed importance.

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#### SUMMARY

The problem of hypopharyngeal malignancy, its incidence, classification, natural history and diagnosis has been reviewed with emphasis on standardization of nomenclature and classification. The value of certain prognostic criteria has been discussed.

A series of 59 cases of malignant disease of the hypopharynx from the Tumor Registry of the Grace-New Haven Community Hospital from 1940-1956 inclusive was reviewed and data regarding the above aspects presented as well as 5 yr. survival rates for radiological and surgical therapy.

Some of the more important historical aspects of the treatment of this disease have been summarized together with the current concepts of radiological and surgical treatment.

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